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Investigating Inhibition of Nitrification Process by Compounds Released in Root Exudates of *Brachiaria humidicola* Plants

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Abstract

Precise nitrogen management requires enough knowledge regarding spatial distribution of mineral nitrogen. If plants themselves could precisely manage nitrification, it could offer very important economic and environmental implications. Finding such plants and related physiological and molecular characteristics can help to introduce such highly valuable properties to farming crops. Nitrification inhibition (NI) by climax ecosystems has been suggested for decades, and this inhibitory effect seems to be a feature of wild genotypes rather than commercial cultivars. Many plants particularly grasses were suggested to have NI activity, and recently *Brachiaria humidicola* (BH) showed promising control on nitrification rates through root exudates. So, in this study during a series of nutrient solution experiments, effects of different conditions such as N form (NH_4^+ vs NO_3) and N concentrations (1, 2 and 4 mM N), plant age, light intensity and different collecting medium for root exudates on NI activity of root washings from BH were investigated. The results showed that BH root exudates when collected in distilled water, independent of light intensity, plant age, N-forms, N-concentrations and root exudates collection periods, had no significant inhibition on nitrification. However, when root exudates were collected in a medium containing 1 mM NH_4Cl, there was significant inhibition on nitrification process in a soil bioassay. This inhibition was more highlighted when plants were grown in ammonium rather than nitrate. Freeze dried root exudates instead of drying with rotary evaporator also showed significance NI in plants which were grown in NH_4^+ under low light, but not higher light intensity, or nitrate nutrition. Measuring electric conductivity of root washings also showed higher conductivity when ammonium presented in root medium, particularly in root exudates collecting medium over extended time (24 instead 6 hours).

Keywords: Ammonium, *Brachiaria humidicola*, electric conductivity, nitrate, root exudates

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